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Environmental changes induced by the development of Ranca resort in a mountainous area

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Abstract: The paper aims at analyzing the most important environmental aspects generated by the development of a touristic resort within a reference mountainous area of the Parang Mountains. The direct and indirect impact of the touristic activity on the environment is evaluated both by analyzing the spatial evolution of the resort according to the French and Austrian Tyrol patterns, and by the integrated analysis of the negative effects induced by the touristic activity on the natural ecosystems characteristic for the high mountainous area. Using various techniques (for instance the Spatial Planning of the Local Territory, the guide published by WTO, measurements on the 1:25,000 topographic map, satellite images), there the POT and CUT urban indexes were determined, together with some specific indicators for touristic pressure on the environment, such as stress and critical ecosystems. The final goal of mapping the ecologic fragility areas situated along the main directions for the settlement development is to underline the potential environmental changes determined by the touristic capitalization of the region.

Key words: mountain tourism, touristic settlement, development patterns, touring activities, Southern Carpathians

Introduction

In Europe, the mountain tourism has differently developed, depending on the natural potential, the distance to the well-known 'tourism heartlands', and other factors such as differences in mentality, social, political and administrative organization of the hosting communities (Gordon & Goodall, 2000).

The development of mountainous tourist resorts in Europe is based on two antithetical reference models that approach quite differently the management of the touristic phenomena. They integrate the "French pattern" that predominated during the first phase for the alpine region of Italy and Spanish Pyrenées, and the "Tyrol pattern" that predominated in southern Germany and north-eastern Italy.

The French pattern began with an elite and modern mountain tourism related to villegiatura, relaxation, promenade, and thermal baths in very popular resorts, such as Val d'Isere, Chamonix, Saint Gervais. The resorts that emerged from an existing settlement were consistently, yet spontaneously, depending on the fame of the area, on the financial interests and local property conjunctures, and, most of all, on the financial resources of the local community (Rogers, 2002).

This model is based on the development of a touristic zone with complex endowments, for integrated resorts that are rather large and concentrated, characterized by specialized human settlements – sky, high altitude, high density of constructions, strict and exclusivist functional zones, circulation segregation – pedestrians, sports, cars (with large parking areas), vast and expensive sport technical facilities, typical urban technical equipment (Gordon & Godall, 2000).

The Austrian Tyrol pattern is concordant to the latest conceptions regarding the mountainous tourism and urbanism, the identity of which is given by the ‚green tourism', ‚environment friendly'.

This development model of the mountain resorts is based on the host community, non aggression of the natural environment and the quality of touristic services, as well as on the host-tourist human relationships (personalized welcoming instead of large series, standard tourist series, depersonalization) (Kousis, 1998).

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The Tyrol model for touristic development offers an optimal base for a sustainable local and regional development, less vulnerable to the economic, social and political conjunctures that affect the tourist industry in the exclusively specialized centre.

According to the Spatial Planning of the National and County Territory, Ranca is classified as recently achieved touristic settlement, strictly specialized and with mono-profile. There are residential zones with high standard, made up of vacation homes of the wealthy people. The touristic infrastructure, although valuable from the built environment point of view (large buildings, made of resistant, quality and expensive materials), include mainly one type: buildings for temporary dwelling, which are homogeneously distributed throughout the area.

In order to underline the impact of the development of Ranca settlement on the environment, its spatial evolution was compared to the French and Tyrol patterns; there were used integrated analyses for the unfavourable effects caused by the touristic activity on the natural ecosystems characteristic for the high mountainous area.

The present study aims at calculating some specific indicators for tourist pressure on the mountain environment components and at mapping the ecologic fragility areas, situated on the main directions for the settlement development.

Area of study

The analysed area lies in the central part of the Southern Carpathians, on their southern slope, at an average height of approximately 1600 m (Fig. 1). The built-up territory of Ranca (Fig. 2) is included in the administrative territory of the town of Novaci and Baia de Fier commune. Ranca area has a high touristic potential as a result of the diversity of relief forms, climatic conditions, hydrographical network, specific vegetation and fauna.

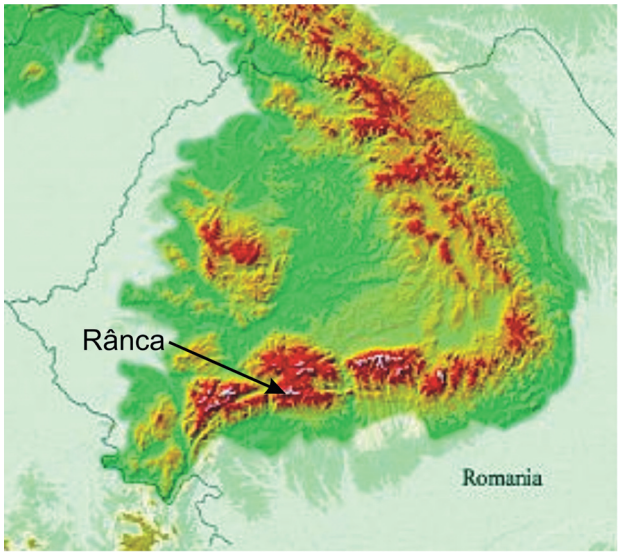


Fig. 1. The location of analysed area within the Romanian Carpathians

The main access road is DN 67 Novaci – Sugag – Sebes, which is modernized up to the northern Ranca zone, from where it winds, at altitudes exceeding 2,000 m, towards Obarsia Lotrului; the road is paved with gravel. Being situated along a road of national importance, there are good premises for the settlement of active people in the area and consequently, the man-induced pressure on the above-mentioned areas will increase. The hearth land of Ranca settlement stretches from the north to the south along the interfluve between the Gilort Rriver in the west and the Galben River in the east, corresponding to the Rau-Ses levelled surface situated at 1,600–1,700 m a.s.l. in the Southern Carpathians.

The Ranca area presents a high touristic potential as a result of the landform diversity, climatic conditions, hydrographical network, and characteristic vegetation and fauna.

The relief is a result of lithological differentiation of the bedrock which acts differently to the action of external agents. Within the high summits, on the granitoids from the Parang Massif, there are frost and snow erosion processes that are modelling a periglacial relief, characteristic on the southern slope, with high frequency of big frost-shattered blocks. In the south, where there is a new alignment of granite intrusions, the complex action of insulation, frost-work and crystallization forces of the solutions that are creeping inside the fissures, there is an intense physical wearing of the rocks, leading to large areas covered by grus.

From the *climatic* point of view, the average annual temperature at Ranca is 4.6°C, and the average precipitation quantity reaches 1,284 mm. The north-western, north-eastern and northern winds have the highest frequency (20.2%, 18.2%, and 17.3%, respectively), while the north-western winds have the highest intensity. The snow layer is present approximately 135 days per year, a fact which allows the development of Ranca settlement first of all as a resort for winter sports.

The area is situated between the upper limit of the spruce woods and alpine zone. The coniferous level lies in the southern Parang at altitudes of 1,400–1,750 m. *Picea abies* is the dominant element of these forests. Due to the continuously widening of grazing zone, the lower limit of the coniferous forest has fallen sometimes by 200–250 m. In the spruce forests, one can also find *Larix decidua*, *Pinus sylvestris*, *Sambucus racemosa*, *Salix caprea*, and *Sorbus aucuparia.* The subalpine vegetation is found at altitudes between 1,750 and 2,100 m. The subalpine shrubs are dominated by *Pinus mugo*, *Juniperus nana* and *Rhododendron myrtifolium*. Along the wet

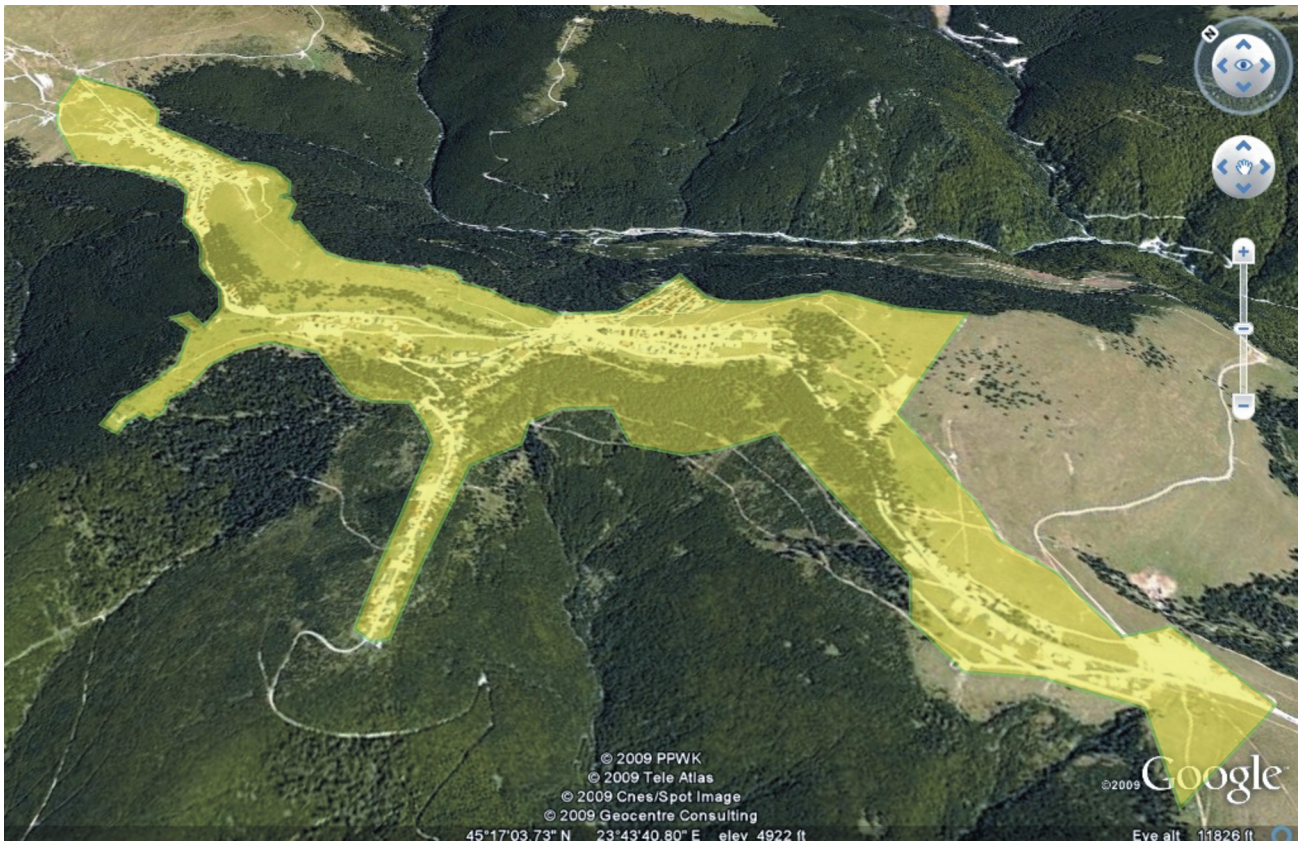


Fig. 2. Aerial view of the analysed area

valleys, *Alnus viridis* shrubs occur. *Vaccinium myrtillus*, *Vaccinium vitis – idaea* and *Bruckenthalia spiculifolia* also appear within this vegetation level.

Secondary grasslands with *Agrostis rupestris*, *Festuca ovina* and *Festuca supina* have taken the place of the juniper trees set on fire or cut by shepherds; subsequently, due to overgrazing, they evolved into grasslands dominated by *Nardus stricta*, which is an oligotrophic plant.

The alpine level is naturally represented in the Parang Mountains at altitudes exceeding 2,100 m, but following the deforestation of subalpine scrubs, the limit has greatly descended. The herbaceous vegetation includes meadows with *Agrostis rupestris*, *Carex curvula*, *Nardus stricta*, etc. There are also species found in the subalpine level too, such as *Campanula alpina*, *Thymus alpestris*, *Cerastium alpinum*, *Phyteuma spicatum*, *Geum montanum*, *Hieracium alpinum, Hieracium villosum*, *Primula minima*, *Scorzonera rosea*, etc. Pioneer ligneous vegetation such as *Dryas octopetala, Salix herbacea, Salix alpina*, and *Loiseleuria procumbens,* due to grazing and strong winds, has greatly degraded; at present, it is found only as clumps here and there in the glacial cirques or on the interfluves.

During the last years, the hearth land of Ranca touristic zone has unreasonably extended by including the already built constructions covering an area of 126.8 hectares. At present, there are 5.7 hectares which are proper for skiing, including two tracks, 0.57 km and 0.48 km in length, respectively; most important, the estimated potential for skiing reaches approximately 110 sq km.

Working methodology

The working methodology of the present study has two main directions. First of all, we analyse the Territorial Units of Reference (TUR) of the settlement from the morphological, typology and spatial functionality point of view, which allows us to establish the model of territorial evolution of the settlement and its effects on the mountainous area. The second direction aims at selecting and interpreting a set of proper indicators for evaluating the touristic impact within Ranca area.

The analysis of the territorial evolution pattern of the settlement

The morphological-typological analysis

Using the Territorial Units of Reference (TUR), there were determined the indexes of man-induced pressure, i.e. POT and CUT, based on the total/built-up areas of the TUR and by comparing the results to the international standards of mountain urbanism (Fig. 3).

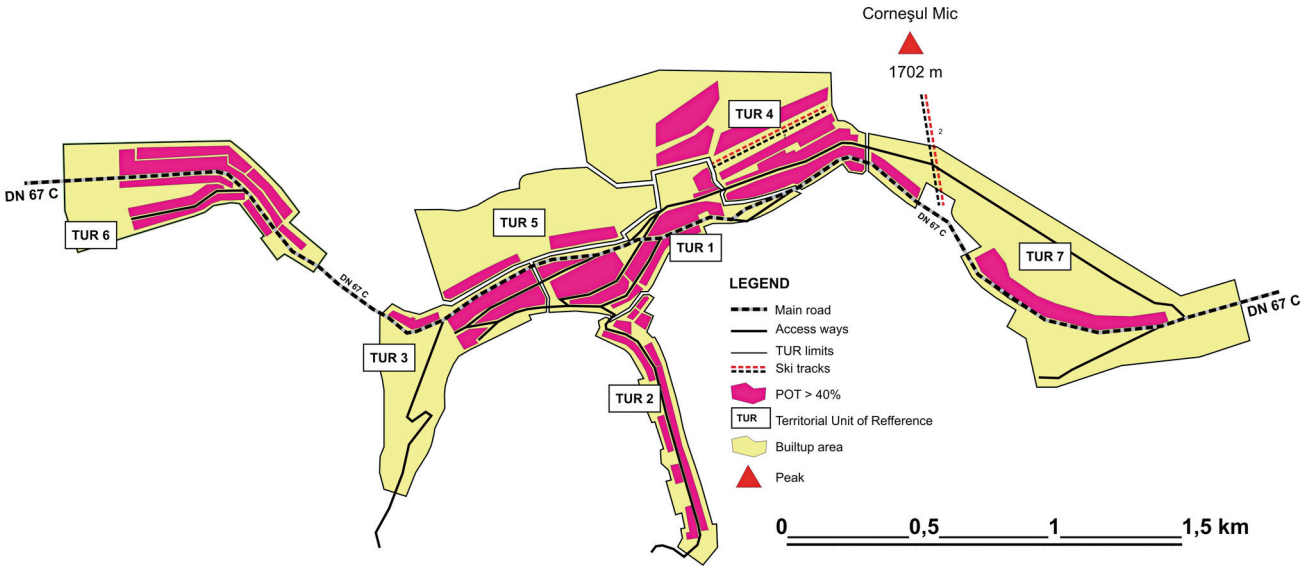


Fig. 3. Territorial Units of Reference (TUR) and the functional-residential distribution

TUR 1 includes the central area, covering approximately 10.5 hectares, acting as the core of Ranca evolution. Here, the terrains leased for holiday-dwellings account for more than 80 per cent, which means there is need for measures regarding the functional reconversion of the area, because these terrains should be of public general interest. In the southern part of this section, there are areas with great landscape and natural ambient value, requiring measurements for the conservation and protection of the ecological equilibrium.

TUR 2 is the second most important core of Ranca settlement. Here, there is a built-up area of 7.1 hectares, being almost exclusively occupied by private dwellings. It generates critical areas for the wood ecosystems in the vicinity, imposing a distance of at least 3 m between constructions and the wood. Since this section is the lowest part of the settlement, the morphology allows the construction of an ecological station for treating the sewage at the western end of it.

TUR 3, contiguous with TUR 1, covers an area of 17.8 hectares and includes only vacation homes built on leased terrains and an area in the west that could be further developed. This western part, which is considered for development according to Zonal Urban Plan is the property of the University of Craiova and is set apart for experiments concerning research development studies regarding the mountain tourism, as well as the biodiversity.

TUR 4 lies eastwards from the national road, having direct access to it, being included to the eastern area, contiguous to the core (TUR 1). It also includes vacation homes, the built-up area covering 9.6 hectares. The main touristic attraction is the corridor used for telesky (cable transport system) and skiing (1). For this zone, there must be established a protection limit of at least 5 m from the wood ecosystem, by withdrawal of the lower parcels lines.

TUR 5 is one of the largest units, with 19.3 hectares, including terrains with special destination (TSD), with a built-up area of 2.06 hectares, having a strategic military use.

Towards the north, there is TUR 6, on a major direction for the settlement's development. It emerged as a separate section, the forest separating it from the rest of the settlement. It is extending, with a built-up area of 9.3 hectares, vacation homes covering 70 per cent of it. Here, there are some treatment facilities and public hotels characteristic for the mountain resorts, which may generate a touristic flow throughout the entire year.

The southern area is included in TUR 7, representing the entrance point to the settlement, with a built-up area of 8.5 hectares, with vacation homes and parking lots as well. From the functional point of view, it is suitable for the construction of general interest objectives, such as gymnasium, stadium. It also has the second couloirs for skiing (2).

Based on the data referring to the absolute surface of TUR, there were determined the main indexes for urban pressure (POT and CUT) for Ranca settlement (Table 1), by determining the built-up area and predominant high regime, as follows:

$$POT = \frac{S_C}{S_T} \times 100 \qquad CUT = \frac{S_D}{S_T}$$

S_C = built-up area; S_D = unfolded area; S_T= total area (TUR).

The calculated indexes exceed the recommended values in the Urban Plan for TUR 1, 2, 4 and 6, indicating a predominant precariousness situation in respect to the proportion of area covered by construc-

Table 1. Calculation of the occupied built-up territory by TUR (according to the Ranca Zone urban plan – Pilot study 6A01/2007, INCD URBAN PROIECT, Bucharest)

No.	Territorial Units of Reference (TUR)	Area (hectares)	Built-up area (hectares)	POT (%)	POT (%) Maximum value
1	TUR 1 – Central core	10.5	6.70	63	50
2	TUR 2 – Western area	12.4	7.10	57	40
3	TUR 3 – Contiguous area [1]	17.8	4.60	26	40
4	TUR 4 – Eastern contiguous area [1]	20.9	9.60	46	40
5	TUR 5 –TDS area	19.3	2.06	11	40
6	TUR 6 – Northern area	21.6	9.30	43	40
7	TUR 7 – Southern area	24.3	8.50	35	40
Total		126.8	47.86	40.14	41.40

No.	Territorial Units of Reference (TUR)	Area (hectares)	Height of buildings	CUT	Recommended CUT
1	TUR 1 – Central core	10.5	Gf +1 4–8 m	1.27	1.05
2	TUR 2 – Western area	12.4	Gf +1 4–8 m	1.14	1.00
3	TUR 3 – Contiguous area [1]	17.8	Gf +M 3–6 m	0.25	1.00
4	TUR 4 – Eastern contiguous area [1]	20.9	Gf +2 6–9 m	0.91	1.00
5	TUR 5 –TDS area	19.3	Gf +1 4–8 m	0.21	1.00
6	TUR 6 – Northern area	21.6	Gf +1 4–8 m	0.86	1.00
7	TUR 7 – Southern area	24.3	Gf +2 6–9 m	1.04	1.00
Total		126.8			

tions with residential and transport functions. From the morphologic and typological point of view, only 10 per cent of the buildings comply with the architectural principles for volumes, covering, materials that were used, orientation, POT and CUT indexes, adopted in the Urban Plan 6A01/2004.

The identification of the spatial functional model

The identification of the spatial-functional model of territorial evolution of the settlement was based on the analysis of the spatial distribution of TUR, taking into consideration the percentage of the present and future building perimeters. This method allowed us to underline the main axes and directions for the development of Ranca touristic settlement (Fig. 4).

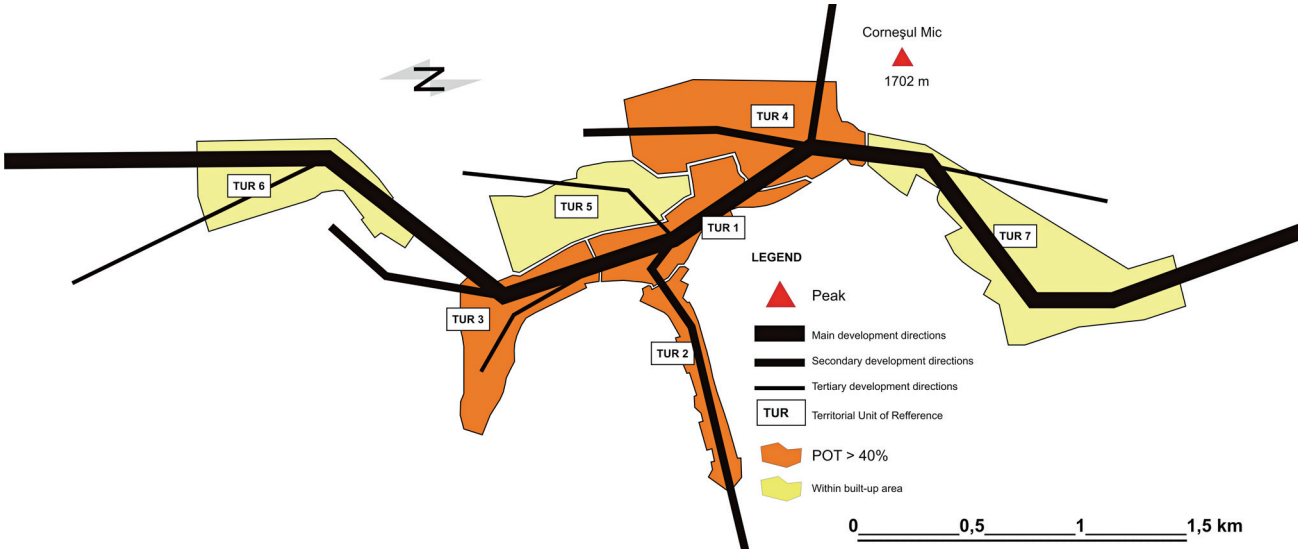


Fig. 4. Main directions for the development of Ranca touristic settlement

At present, the hearth land of Ranca is stretching from the north to the south, with secondary axes, according to the terrain configuration, on one hand, and due to the presence of the main access road (DN 67C), on the other hand.

The built-up area gradually extended, first by the emergence of some functional micro zones included in the first TUR, and then by leasing plots from TUR 6 and 4, with direct access to the main development axis.

The built-up area includes mainly private vacation homes erected on leased plots. Following the lack of a development strategy of the settlement, there emerged many buildings that do not fit into the landscape. Consequently, there is a functional discontinuity**,** leading to the fragmentation of the logical structure of spatial and functional organization and distribution within the analysed area.

That is why there is no clear, coherent and justified functional zoning. Within the present limits, there is no area of public interest, there are hardly any objectives of this kind, and the possibilities for revitalisation are quite a few.

Comparing Ranca to the French and Tyrol models

The analysis of the main development patterns for mountainous resorts in France and Austria indicated that there are five major components that play a vital role in the spatial and functional evolution of touristic settlements. These are: *excessive urbanisation, specificity, local identity, traditional economy and tourism based on environment protection* (Table 2).

The evolution model was achieved by referring to the five elements classified for quality determination (according to Mountainous Resorts Development Strategies, UGS, USA 1997).

This method allows the multi-criteria analysis of the potential effects of the development of a touristic settlement in the mountainous area, by identifying the negative effects and the urban objectives of the settlement.

Taking into account the spatial and functional structure of the built-up area, as well as the characteristics of Ranca area, the evolution pattern of Ranca was compared to those of the French and Tyrol patterns (Table 3, Fig. 5).

The comparison between Ranca development and the two reference models from Europe points out that there is an evolution pattern with great tendencies for development, leading to the increase of urbanisation degree of the mountainous area, a more diverse economy to the prejudice of traditional activities, limited support for the potential touristic forms and a touristic psychology that disregards the natural environment quality.

The analysis of touristic impact on Ranca mountainous area

The second methodological approach aims at describing and highlighting the environmental changes induced by the continuous spreading of the built-up area at Ranca. The way was analysed, in which touristic activities interfere with natural resources,

Table 2. Quality determination for the morphological and typological classification of mountainous resorts (EC (European Commission), 2001)

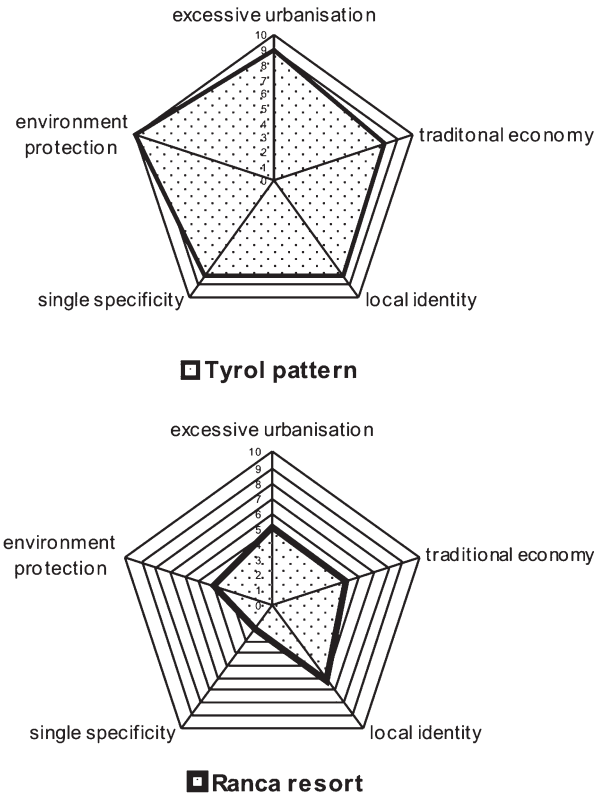
Quality determination	Excessive urbanization	Traditional economy (traditional activities)	Single specificity (tourism forms)	Local identity (natural touristic objectives)	Green tourism
1	POT>60%	0–2	1	<3	Aggressive tourism, leading the functional decay of the natural environment
2	CUT 2–7		1–2		Aggressive tourism, with structural decay of the natural ecosystems
3	POT>50–60%	3–6	2–3	3–5	Tourism disturbing life forms
4	CUT 2–5				
5	POT 30–40%				Tourism generating discomfort
6	CUT 1–3				
7	POT>20%	>6	3-5	6-8	Tourism that does not greatly affect the natural environment
8	CUT 1–2				
9	POT>10%			>8	Ecologic tourism
10	CUT 1–2		6		

Table 3. Quality determination for mountainous resorts

Reference indicators	Quality determination according to		
	French pattern	Tyrol pattern	Ranca
Excessive urbanisation	1	9	5
Single specificity	2	8	2
Local identity	5	8	6
Traditional economy	1	8	5
Environment protection	3	10	4

Table 4. Main categories of impact caused by tourism on the natural environment

1. Erosion processes	Soil compaction
	Gullies, ravines and landslides
	Water and air pollution
2. Pollution	Noise
	Waste
3. Biodiversity	Damage to the natural habitats
	Shrinking of areas covered with natural vegetation
4. Natural resources	Overexploitation of water reserves



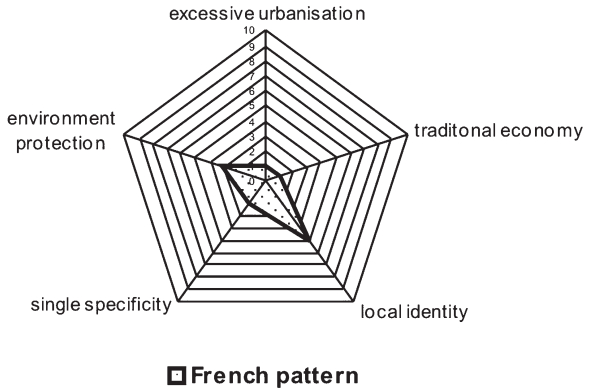


Fig. 5. Development patterns

biodiversity, as well as the influence on the erosion and pollution phenomena.

Since there are few flat terrains in the area, most of the dwellings were built on gentle or sometimes steep slopes, triggering rain-wash processes that cause soil erosion and, finally, gullies emergence. Since the materials used for building is not always light, there is a compaction of the soil, which further adds to the degradation processes (Table 4).

During the holidays, the settlement is overcrowded, there are lots of cars which cause sound and air pollution due to traffic and sometimes to the improper behaviour of the tourists. The soil is also polluted by all sorts of garbage disposals from the parts of the tourists and locals as well.

The model for evaluating the natural impact caused by the touristic activity in the mountain area integrates five stress factors that are characteristic for the mountainous tourism (Table 5).

Discussion

Trail use causes significant effects in terms of soil degradation, due to erosion on the steeper slopes and trampling, which affects physical soil properties, such as water storage. Disturbance and fragmentation of wildlife habitat were also considered as important because trekking routes criss-cross the habitat areas of endangered species, and the presence of

Table 5. Potential impact of touring activities in high mountains

Receptors		Impacts	Stressors				
			Trail use	Waste dumping	Camping	Pack animal grazing	Off-road driving
Physical	Soil	Soil degradation	●		●		●
	Water	Groundwater pollution		●	●		
		Surface water pollution		●	●		
Biological	Wildlife	Habitat fragmentation	●		●		●
		Habitat disturbance	●		●		●
	Vegetation	Vegetation trampling/damaging	●		●	●	●
		Overgrazing				●	

● – Potentially significant impact, ● – Minor impact (not studied) (EC (European Commission), 2001)

tourists may cause temporal or permanent habitat loss (Geneletti, 2008) The effects of trail use on vegetation were considered less significant, due to the general absence of vegetation on trails. As to dumping, its potential impact on both groundwater and surface water bodies was considered. Camp sites affect soil and vegetation due to the presence of the facilities and trampling by campers. Water pollution caused by waste disposal, and disturbance to wildlife habitat by campers were also addressed. Although campsites might cause disruption of habitat patches, this was considered a minor effect, due to the compactness and small size of camping sites. Pack animals may cause overgrazing, especially where the slope allows easy access to nearby grasslands. Finally, the significant impacts of off-road driving include damage to soil and vegetation structure, and wildlife disturbance. Habitat fragmentation was considered as a minor effect, because most off-road tracks do not interfere with the patterning of habitat patches.

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